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IMPROVEMENTS NECESSARY IN MACHINE-TOOL PRODUCTION

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During the Five-Year Plans Soviet machine-tool manufacturers attained significant success, not only in increasing production, but also in expanding the variety of machine tools. During the Second Five-Year Plan 200 new types of machine-tools were put into operation and in 1940 about 500 models. During the current Five-Year Plan the production of 2,300 models is expected.

At present, all the basic branches of machine manufacture, automobile, tractor, aviation, machine-tool, transport, and others, are equipped with the very latest high-duty machine tools and press-forging equipment. Any kind of machine necessary to the national economy can be made at Soviet plants.

Modern mass production cannot be successfully developed without special machine-tool and press-forging machines. Productivity in machining parts on these machine tools is many times higher than on universal machine tools. High-duty special machine tools reduce the demands on labor as well as on the space required for equipment. This is a result of automatization and simultaneous operation of several tools.

The first combination machine-tools were developed at the ENIMS (Experimental Scientific Institute for Metal-Cutting Machine-Tools) in 1934, under Engineer 7. I. Dikushin, and manafactured at the Stankokonstruktsiya Plant.

The automatic transfer machine-tool line is the outstanding achievement of Soviet machine-tool manufacture. The first automatic line, completed in the Stankokonstruktsiya Plant in 1946, consisted of 14 machine-tools for making cylinder heads for the KhTZ tractor motor. Only one eighth of the time formerly required is now spent on the manufacture of these parts, and only two operators are needed. The labor saved by this automatic line is equal to that of 56 men. Eighty universal lathes would be needed to manufacture these parts by ordinary methods.

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In the Machine-Tool Plant imeni Ordzhonikidze automatic lines for the engine block of the ZIS-150 automobile are manufactured. The line consists of 16 combination machine-tools in two rows of eight machines each with 228 working spindles. Five hundred and thirty-six different kinds of cutting and measuring instruments for drilling, boring, reaming and threading etc. participate simultaneously in the work. The capacity of the line is 30 blocks per hour at the rate of one every 2 minutes. The entire automatic line is operated by two workmen.

At present the Ministry of Machine-Tool Building has planned a new automatic plant for making aluminum pistons for truck motors which meets all the requirements of contemporary, advanced technology. The manufacturing process, from the casting and the mechanical and heat treatment to the packing of the finished product, will be entirely automatic. Two automatic shops for machining piston rings for the JFZ-NATI tractors and wheeled tractors are also being designed.

The outstanding achievement of Soviet designers and machine-tool builders is the construction of the semiautomatic, electric, profile-milling process designed by Engineer N. Sokolov, who received the Stalin Prize in 1948 for it. It was built at the Plant imeni Sverdlov in Leningrad. The machine is intended for the milling of dies, press moulds, and other parts having complex shapes. As a result of electronic control the machine runs smoothly and uninterruptedly. The cutter has 12 different speeds, from 75 to 950 revolutions per minute. The machining reaches an accuracy of 5 microns.

A series of semiautomatic, multicutting lathes for machining camshafts in auto-tractor motors are made in the progressive Krasnyy Proletariy Machine-Tool Plant in Moscow. High-duty machine tools have also been made for machining railroad car axles. The entire operating cycle is completely automatic. A new semiautomatic, high-duty, vertical, six-spindle machine has been constructed for the roughing and finishing of parts up to 500 millimeters in diameter. It incorporates six seperate machine tools and has one driving gear and one set of controls.

At a Moscow internal grinding machine plant a new type of universal thread-grinding machine of original design has been built by the Stalin Prize winners Merpet and Pokhorovski. It is to be used in tool shops for threading and tool relieving. The special characteristic of the machine is the automatic adjustment of the abrasive wheel in proportion to its grinding. All operations during grinding are automatic. The machine is very sturdy, vibration resistant, and is simple to manufacture and repair.

A great number of new universal machine-tools as well as hundreds of special-purpose machine tools were put into operation in 1947 and 1948. These included 16 types of press-forging equipment, such as a steam-hydraulic forging press of 800-ton capacity, cold-forging automatic machines, a 150-ton crankshaft press, new guillotine shears, forge hammers of from 75 to 2,000 kilograms, a cotton-baling press of 550-ton capacity, a multiple-spindle press, nail-making machines, special machines for making railroad spikes, and other new machines.

By the end of the Five-Year Plan the number of metal-cutting machine-tools will reach 1,300,000. Besides the restoration of 18 machine-tool plants destroyed by the Germans, five new plants are to be built and put into operation. There will be two plants for heavy-duty machine tools, and three for combination and special machine-tools.

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High-production machines of greater technical [illegible] spindle combination and automatic machines must be [illegible] planned output of 74,000 machines, 12,300 will be [illegible] types. Such growth in the output of special machine tools [illegible] raise production in the machine industry. Special [illegible] to 15 times more productive than universal machine tools.

Soviet machine building has already surpassed the prewar level of production. In 1948 the output of metal-cutting machine tools increased 24 percent as compared with 1947, and the output of special and combination machine tools increased 42 percent.

Modern technology makes use of four basic methods to obtain the required details, form, dimensions and quality. These are casting, forging and swaging, chip removal, and heat treatment.

To create a more productive technology the finishing process involving chip-removal must be curtailed, and casting and swaging must be more widely applied. Swaging and stamping guarantee maximum utilization of mechanical forces on the metal and better quality in the article being produced. These methods will save metal, shorten the time required for finishing processes, and reduce the need for metal-cutting tools.

Technological swaging should curtail, and in some instances completely eliminate, the finishing process entailing chip removal. The problem facing the press-forge workers is the production of parts which need only partial machining or no finishing at all.

The broad introduction of sizing and embossing of stamped parts has, in a number of cases, obviated after-treatment through cutting. Sizing and embossing can give a high-quality surface, as well as exact measurements, not only up to tenths, but up to hundredths of millimeters. In the field of drawn stock, various machines for making bolts, nuts, rivets, spikes, chains, etc., may be mentioned. All these machines are much more highly productive than metal-cutting machine tools, and use much less metal.

The production of press-forging equipment under the new Five-Year Plan is 2½ times greater than the prewar level of production. Steam-hydraulic presses of 200 - 2,000 tons pressure, embossing presses of 100 - 2,000 tons, heavy mechanical presses of up to 2,500 tons, hammers of 2 - 3 tons and cold-forging machines must be manufactured.

Along with increasing the output of machine tools and automatic transfer machine-tool lines, there must be a sharp increase in the production of boring machines, boring-and-trimming machines, automatic and semiautomatic machines, gear-cutting machines, longitudinal planing machines, radial drills, turning lathes, and grinding machines in order to satisfy the most varied branches of the national economy, especially machine building. The machines must be completely equipped with attachments, raising their universality and productivity, as well as permitting their changeover from one line of production to another.

Within the next few years the following heavy-duty machine tools of new design will be in production again: gear-cutting machines for gears of 1.5 - 9 meters in diameter, boring machines with sheets of 120 millimeters and longer, and boring-and-turning tools for finishing articles up to 18 meters in diameter, latheral milling machines with a 3-meter cutting width, lathes with centers 1.5 meters high, large-scale roll lathes, and roll grinders. In order that the stock of machine tools will not be cluttered up with low-quality products produced by a number of ministries and

not in demand, the government has forbidden these ministries and departments to enter into the production of metal-cutting machines and forging and press-forging machines of new design without the permission of the Ministry of Machine-Tool Building and the State Technical Department (Gostekhnika) of the USSR.

Raising labor productivity in machine building demands the introduction of high-speed metal-cutting methods using mass produced hard-alloy tools as well as increasing the types of new tools and abrasive devices for finishing hard alloys.

Soviet machine manufacturers have opened great possibilities in the field of metal-cutting. The cutting speed in many cases surpasses 300 meters per minute. Stakhanovite T. Borkevich of the Plant imeni Sverdlov cuts from 400 to 700 meters a minute.

In the Krasnyy Proletariy Plant modern lathes are being produced, which, in comparison with old-style lathes, have increased the spindle revolutions from 600 to 1,200 per minute. A new high-speed lathe with a spindle reaching up to 3,000 revolutions per minute has been built as a model. Mass production of new high-speed boring machines has been set up in the Plant imeni Sverdlov in Leningrad. In the Gor'kiy Milling Machine Plant a heavy-duty vertical milling machine with a spindle attaining 1,500 revolutions per minute has been built. Work is being carried on in the construction of high-speed drilling machines, automatic machines, and boring and grinding machines.

Scientific research in the field of high-speed machining is still weak.

The reserves at the disposal of the Soviet machine industry are large and varied. The actual machining time in many factories consumes an average of 50 - 65 percent of the machine-tool operating time. This means that 35 percent of the time is used by the machine in auxiliary operations, rather than in acutual cutting.

In many ministries and departments poor use is made of the existing stock of metal-cutting machine tools and press-forging machines. The repair and replacement of unserviceable equipment is unsatisfactory, and no serious measures are being taken to improve the industry's repair centers. Some directors of enterprises and departments have made unjustified demands for new equipment instead of requesting proper repair and putting their existing equipment back into service. The government has ordered the ministries and departments to take urgent measures to improve the repair of equipment. Each enterprise must keep a chart on such repair. Measures must be taken to improve the repair centers. The repair shops of enterprises must be relieved of work not connected with equipment repair.

To decrease waste in metal during machining and to obtain the best use of available metal-cutting machine tools, especially automatic and semiautomatic types and turret lathes, metallurgical plants must increase the output of special shaped sections of metal, of various cross-sections of calibrated rolled iron, as well as sectional rolled iron.

For the successful solution of the problems confronting machine-tool building in supplying industry with new metal-cutting lathes, presses, and hammers, the following steps must be taken:

a. The work of machine-tool plants and of [redacted] building must be reorganized so that basic types of [redacted] and hammers can be mass produced.

b. High-production technology must be utilized in [redacted] in machine shops, assembly shops, and billet shops. [redacted] casting, stamping with high-speed presses, automatic welding and [redacted] machining of metal.

c. Labor in machine and assembly shops which is now done manually must be mechanized.

d. Standardization of machines, parts, and units must be introduced in order to permit reduction of production costs, a curtailing of the assembling cycle, and a decrease in planning time. Standardization also creates conditions for extensive cooperation and specialization in the manufacture of machines and will help raise the quality of the product.

e. Experimental machine-tool building bases, especially in the big plants, must be expanded. The level of scientific research designing and experimental work in the field of building domestic machine tools, presses, and hammers must be raised.

f. During the current Five-Year Plan building, restoration, and redesigning of the Leningrad Plant imeni Sverdlov and the Stankolit plant; the Krasnodar Machine Plant imeni Sedin, the Gor'kiy Milling Plant, the Minsk Plant imeni Voroshilov, the Voronezh Press-Forging Equipment Plant, the Chimkent Cold-Forging Automatic Machine Plant, the Kolomna, Kramatorsk and Ryazan Heavy Machine-Tool plants, and other machine-tool and press-forging plants must be completed.

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